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PHSB STUDIES

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AN UNNECESSARY DEATH INDEX

There exists great variation among county death rates in North Carolina. The disparity between the highest and lowest death rates can be observed in Tables 1 and 2 which show striking differences by age and cause of death. If it can be assumed that innate disease proneness of people in different counties is basically the same, then conditions existing in counties with the lower rates are the more favorable conditions for health. The number of deaths that occur under these conditions could be considered expected, and the number of deaths that exceed this expected amount could be considered unnecessary.

A study done in 1967 by the National Center for Health Statistics estimated unnecessary deaths among the states (1). In order to examine unnecessary deaths in North Carolina, the basic model used by NCHS was modified and applied to each of the 100 counties in the state, utilizing more current and more detailed data. For the purpose of this study, "unnecessary deaths" have been defined as those deaths which are in excess of the number of deaths which would have occurred had the average of the fifteen lowest county death rates prevailed.

Deaths to residents of each of the counties were separated into 96 different groups or cells: 8 age groups, 2 race groups, 6 cause of death groups (the 5 leading causes and an "all other" category). Five years (1971-1975) of deaths were used to help insure sufficient numbers and therefore more reliable data. Death rates per 100,000 population were calculated for each cell.

In determining the average of the fifteen lowest rates for each of the 96 cells, all 100 counties were not used since some counties had too few residents in a given race group to insure reliable data. To be included in the determination of the best 15 rates for each cell, a county had to have an average annual population of at least 3,000 in each race group. Thus, 99 counties were used to determine the best rates for whites and 71 counties were used to determine the best rates for non-whites.

Table 3 shows the average of the 15 lowest death rates for each of the 96 cells. It can be seen that some of the cells have zero rates. In such cases, the 15 counties all had no deaths in those categories.

To determine expected deaths for a county, the rates of Table 3 were applied to the corresponding population of the county. These are the numbers of deaths that would have occurred under the "most favorable" conditions. The differences between these deaths and the deaths that actually occurred may be considered excess or unnecessary deaths. The summation of these deaths yields the number of unnecessary deaths that a county had in a particular cause group, age group, race group, or in the county as a whole.

An unnecessary death index (UDI), where the unnecessary deaths are expressed as a percentage of the actual deaths, is needed to compare counties. A county's UDI is the percent of its deaths which would <u>not</u> have occurred had it experienced the average death rate of the best 15 counties. A UDI may also be calculated for each of the cause, age and race groups.

Table 4 shows North Carolina's UDI's for causes, ages, and overall mortality. Each is quite close to the mean UDI of the 100 counties. High UDI's are observed for the two accident groups and the three age groups in the 5 to 35 year range.

Table 1

Highest and Lowest Death Rates by Age Group

North Carolina Counties, 1971-1975

Age Group	Death Rates: Lowest County	Death Rates: Highest County	Range
1- 4	232.108	777.874	545.765
5-14	0.000	134.348	134.348
15-24	65.963	246.794	180.831
25-34	92.033	327.815	235.782
35-44	217.450	588.872	371.421
45-54	531.302	1247.634	716.332
55-64	1219.875	2379.136	1159.261
65+	4376.039	6824.620	2448.582

Table 2

Highest and Lowest Death Rates
by Underlying Cause of Death

North Carolina Counties, 1971-1975

Cause Group	Death Rates: Lowest County	Death Rates: Highest County	Range
Heart	119.436	528.067	408.631
Cancer	59.409	232.405	172.996
Stroke	34.655	223.365	188.710
Motor Vehicle Accidents	15.113	69.981	54.868
Other Accidents	21.192	72.723	51.531
All Other Causes	161.311	425.952	264.641

Table 3

Average of Fifteen Lowest County Death Rates

	White							
	Age Groups							
	1-4	5-14	15-24	25-34	35-44	45-54	55-64	65+
Heart	0.0	0.0	0.0	0.0	23.02	156.75	472.78	2174.55
Cancer	0.0	0.0	0.0	0.0	24.67	121.68	270.48	602.73
Stroke	0.0	0.0	0.0	0.0	0.0	14.15	48.73	593.27
Motor Vehicle Accidents	0.0	0.0	29.28	13.86	3.17	2.73	5.17	9.03
Other Accidents	0.0	0.0	6.07	2.60	2.04	7.68	6.26	43.14
All Other Causes	211.11	2.67	11.14	22.98	61.31	134.51	262.08	975.65
	Nonwhite							
Heart	0.0	0.0	0.0	0.0	63.56	228.48	596.41	1752.39
Cancer	0.0	0.0	10.0	0.0	23.42	136.52	289.08	640.26
Stroke	0.0	0.0	0.0	0.0	12.49	63.96	191.21	820.42
Motor Vehicle Accidents	0.0	1.24	20.62	17.62	11.19	16.54	2.81	2.74
Other Accidents	8.47	0.68	12.55	9.31	18.09	29.48	15.76	23.08
All Other Causes	460.36	2.75	38.28	117.22	213.44	298.07	408.10	952.35

(N=99) White Population $\geq$3,000 for White Matrix
(N=71) Nonwhite Population $\geq$3,000 for Nonwhite Matrix

Table 4

North Carolina's Unnecessary Death Index

Cause Group	Actual Deaths	Excess Deaths	UDI	Mean UDI of 100 Counties	Standard Deviation of UDI of 100 Counties
Heart	83,854	18255.49	21.771	20.1	11.6
Cancer	36,669	11911.93	32.485	29.8	9.3
Stroke	27,931	10666.38	38.188	35.1	14.4
Motor Vehicle Accidents	8,865	6288.71	70.939	71.8	10.3
Other Accidents	8,436	6231.95	73.873	74.0	5.8
All Other Causes	65,926	20585.95	31.226	29.6	7.3
Age Group					
1-4	10,660	4510.90	42.316	41.3	15.9
5-14	2,304	2146.09	93.146	92.0	9.6
15-24	7,231	4409.19	60.976	61.6	10.7
25-34	6,586	4365.97	66.292	66.2	8.8
35-44	10,738	6110.17	56.902	55.6	9.2
45-54	24,542	10028.20	40.861	38.8	8.7
55-64	41,121	14308.91	34.797	32.6	9.1
65+	128,499	28061.03	21.838	21.6	6.7
Total	231,681	73940.13	31.915	31.0	6.5

These results are consistent because accidents often involve these age groups. The age group 5-14 has a very high UDI because, under the most favorable conditions, few or no deaths should occur; therefore, almost every death would be unnecessary.

Deaths due to heart conditions, while the numbers are large, have a relatively small UDI because the numbers of deaths due to heart problems are large in all counties, even the counties with "good" conditions.

The county UDI values range from a low of 14.3 to a high of 44.6 with a mean of 31.0 and a standard deviation of 6.5. Looking at Table 5, two counties are compared to see how they differ. Henderson County had 2,470 deaths to occur during the five-year period of this study, and of those, 590 were excess or unnecessary for a UDI of 23.9. This is a below average UDI (see Table 4), mainly due to the low UDI for heart disease and correspondingly for the older age groups. Rockingham County, on the other hand, had 3,933 actual deaths and of those 1,420 or 36.1% were excess. The UDI was generally higher than average for each age and cause group.

The map on page 7 shows the geographical distribution of the total county UDI's. The counties were grouped using a clustering routine from the Statistical Analysis System computer package (2). Eastern counties generally have higher UDI's than western counties. In particular, a band of counties in the southeastern section has high UDI's while many western counties have lower than average UDI's.

The concept of the unnecessary death index is relatively easy to comprehend and it shows that mortality varies widely across North Carolina; indeed, there do exist gross inequalities in the health status of counties. Individual counties may wish to contact the Public Health Statistics Branch to obtain county data comparable to that presented for Henderson and Rockingham counties (Table 5).

REFERENCES

(1) Lillian Guralnick and Ann Jackson. "An Index of Unnecessary Deaths." Public Health Reports, Vol. 82, No. 2, February 1967, pp. 180-182.

(2) Anthony J. Barr, James H. Goodnight, John P. Salls, and Jane T. Helwig. Statistical Analysis System, Cluster Procedure. SAS Institute, Inc., Raleigh, N.C., 1976.

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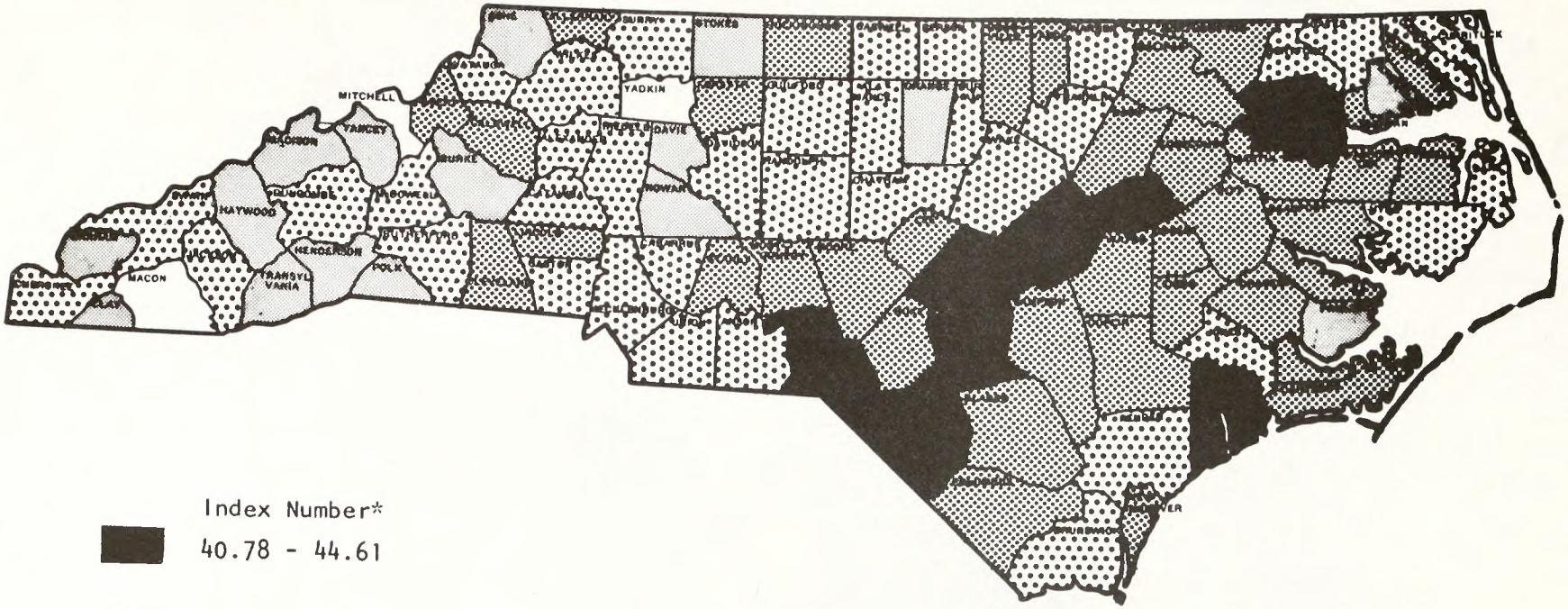
Table 5

A Comparison of Two Counties'
Unnecessary Death Indexes

	Henderson County			Rockingham County		
Cause Group	Actual Deaths	Excess Deaths	UDI	Actual Deaths	Excess Deaths	UDI
Heart	871	19.51	2.240	1,478	404.82	27.390
Cancer	455	157.76	34.671	645	243.65	37.775
Stroke	327	118.07	36.106	450	174.71	38.825
Motor Vehicle Accidents	56	35.48	63.354	130	95.28	73.289
Other Accidents	94	72.70	77.339	108	75.20	69.631
All Other Accidents	667	186.58	27.973	1,122	426.40	38.004
Age Group						
1-4	66	28.86	43.721	177	99.78	56.373
5-14	20	18.90	94.492	39	36.80	94.350
15-24	29	11.48	39.592	128	92.86	72.547
25-34	57	43.94	77.092	91	62.40	68.570
35-44	71	39.88	56.170	174	109.68	63.034
45-54	162	44.72	27.603	399	175.25	43.922
55-64	343	73.80	21.516	727	290.53	39.963
65+	1,722	328.51	19.077	2,198	552.76	25.148
Total	2,470	590.08	23.890	3,933	1420.05	36.106

Unnecessary Death Indexes
for
North Carolina Counties



Index Number*

40.78 - 44.61

32.19 - 40.77

24.68 - 32.18

16.39 - 24.67

14.30 - 16.38

*Low number indicates favorable conditions.

1971-1975 Resident Data

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